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The effect of direct and indirect taxes on poverty in developing countries

By

TEWA PAPY VOTO

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Supervisor: Nicholas Ngepah

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DECLARATION

I certify that the minor dissertation submitted by me in partial fulfilment of a Master's Degree of Commerce in Development Economics at the University of Johannesburg, is my independent work and has not been submitted by me for a degree at any other University.

Tewa Papy Voto

ABSTRACT

This dissertation investigates the effect of direct and indirect taxes on poverty in developing countries, which are characterized by higher level of poverty and low level of total tax revenue as share of GDP. We use an annualised panel data of 37 developing countries for the period 1995-2016. Panel cointegration, Dynamic Ordinary Least Squares (DOLS) and Fully Modified Ordinary Least Squares (FMOLS), the Dumitrescu-Hurlin causality test and the Pooled Mean Group (PMG) were employed to determine the short- and long-run impact of direct and indirect taxes on poverty, and to assess the direction of the causal effects among the variables. The results from the FMOLS and DOLS show that only tax on goods and services and corporate taxes are negative and significant in explaining poverty in the long run in developing countries. From the Dumitrescu-Hurlin causality test, the findings indicate that there is a causality running from corporate taxes to poverty, while tax on goods and services cause poverty and vice versa. Finally, the PMG demonstrates that while the long-run estimates show a negative and significant relation among our variables in developing economies, the short-run relationship indicates that the link is statistically insignificant, with an error correction term of 0.059. Therefore, the short-run deviations from the long-run equilibrium are corrected at the speed of 6% each year. The overall findings support that argument that taxes on goods and services combined with corporate income taxes play a key role in reducing poverty in a long-run in developing economies. Therefore, the policy recommendation of this is that transfer and tax system should be designed in the way that income received from transfer should be more than taxes paid by the poor. And the revenue mobilized from taxes on good and services and corporate income taxes should be allocated to education at the early stage.

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LIST OF ACRONYMS / ABBREVIATIONS

ADF: Augmented Dickey-Fuller

ARDL: Autoregressive Distributed Lag

CGE: Computable General Equilibrium

CIT: Corporate Income Tax

DOLS: Dynamic Ordinary Least Square

FE: Fixed Effect

FGP: Fiscal Gain of Poor

FI: Fiscal Impoverishment

FGT: Foster-Greer-Thorbecke

FMOLS: Fully Modified Ordinary Least Square

GDP: Gross Domestic Product

GMM: Generalized Method of Moments

GRD: Government Revenue Dataset

H: Headcount

ICTD: International Centre for Tax and Development (ICTD)

IPS: Im, Pesaran and Shin

KPSS: Kwiatkowski, Phillips, Schmidt and Shin

LLC: Levine Lin and Chu

LM: Langrage Multiplier

MDG: The Millennium Development Goal

MPI: Multidimensional Poverty Line

OLS: Ordinary Least Square

PG: Poverty Gap

PIT: Personal Income Tax

PL: Poverty Line

PMG: Pooled Mean Group

PP: Phillips-Perron

PPP: Purchasing Parity Power

RE: Random Effect

SDG: Sustainable Development Goals

SPG: Squared Poverty Gap

SWIID: standardized World Income Inequality Database

TGS: Tax on Goods and Services

TV: Television

VAT: Value added Taxes

WBI: World Bank Indicator

2 SLS: Two Stage Least Squares

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CHAPTER 1: INTRODUCTION

This chapter is structured as follows: Section one deals with the background and problem statement of this research. Section two presents the research motivation while section three provides its contribution to the literature. Section four deals with the research questions and section five presents the importance of the dissertation. Finally, section six provides the structure of the minor dissertation.

1.1 Background and problem statement

The world economy has made considerable improvement over the last two decades in raising the living standards of the poorest. In 1990, about 37% of the global population or 2 billion people, lived below the global poverty line of $1.90 per day. PovcalNet database reveals that in 2013, the period for which the most recent international poverty estimates are available, the amount of those living in extreme poverty had decreased above 60% (766 million people). In the same period, the percentage of the world population living in extreme poverty reduced rapidly to 11% from 37%. The Millenium Development Goals (MDG) of reducing the amount of the extremely poor by half in developing economies from 1990 to 2015 was met in 2010. This is five years ahead of time. Despite this remarkable progress, recent World Bank estimates show that 770 million people were extremely poor in 2013. Ending extreme poverty is a key objective of the global development community. However, eradicating poverty in all its forms is the main and first of the seventeen Sustainable Developemnt Goals (SDG) adopted by the United Nations, and the World Bank has set a main objective of alleviating the rate of the extremely poor at 3% by 2030 (Castañeda et al. 2018).

Castañeda et al. (2016) show that the picture of poverty in developing countries is largely young and rural; 75% of the moderate poor (those who live between $1.90 as the minimum international poverty line and $3.10 as the maximum) live in rural zones as do 80% of the extremely poor (those below $1.90). Almost 60% of the extremely poor reside in households with three or more children, and above 45% of the extremely poor are less 15 years old. The question is whether the continuous persistence of poverty in developing countries is about the implementation of policies for poverty alleviation or nationally raising the required revenue.

Raising sufficient revenue to finance government spending is the main objective of the tax structure of any government in developing countries. As a legal structure, a tax system governs the implementation of the different types of tax such as tax on income, trade tax, consumption tax and social welfare. Governments determine the tax rate and the composition of their taxes. The optimal

taxation theory opted for the tax system that maximises social welfare (Diamond and Mirrlees, 1971; Atkinson and Stiglitz, 1976; Saez, 2010; and Maina, 2017). Although recognising the principle of maximising social welfare through a taxation system, developing countries still face significant challenges in collecting revenues to finance their developmental policies (Musgrave and Thin, 1948). This is due to weak tax systems which reduces government's capacity to offer social services to the poor.

1.2 Motivation for this research

Given the fact that poverty constitutes a challenge for developed and developing countries, scholars (Nyamongo and Schoeman, (2007) and; Lustig and Higgins (2016), find that progressive taxation is more preferable in reducing poverty than regressive taxation due to its efficacy in redistributing revenue in developing countries. In this context the rich are taxed at the highest marginal rates. Therefore, the tax revenue generated through progressive taxation is redistributed to those living below the poverty line (PL). This argument seems specifically effective for a country with high levels of inequality such as South Africa.

In comparison to the above argument, Musgrave and Musgrave, (1989) and Djankov et al. (2010) claim that despite the effectiveness of progressive taxation in alleviating poverty through redistribution, it discourages the incentive to work more in a bid to save more as the marginal tax rate rises with income. This may decrease economic growth as people opt for working less and spending more time in leisure because of higher marginal tax rates.

Most studies (see for example Maina, 2017; Keen 2008) find that decreasing a regressive tax could be beneficial to the poor who benefit for nonzero-rated products in developing countries. Studies confirmed that first, a reduced value added tax (VAT) rate gives more disposable income to consumers who buy goods on which VAT is levied. This increase welfare through purchasing power and reduces poverty. Second, the increased disposable income from the reduced VAT available to consumers may be saved.

Increased savings lead to more money in the financial system which may be channelled into profitable investment programmes. This leads to higher economic growth and poverty alleviation. Third, reduced VAT increases the demand for products through which VAT is levied. This higher demand increases production which could lead to the need for more labour, which decreases unemployment and reduces poverty. Other researchers (Keen, 2003) show that a rise in VAT does not necessarily

lead to poverty alleviation, because of the economic theory which implies that indirect taxes usually constitute a load for poor households, and that zero-rating of certain taxable goods consumed by the poor would have small fiscal effect.

In light of the uncertainty over which tax design (direct or indirect taxes) affects poverty, it is therefore critical to analyse the effect of direct and indirect taxes on poverty in developing countries. It appears that while some researchers demonstrate that direct taxes such as corporate income tax and personal income tax decrease poverty (Schoeman, 2007), others such as Maina, (2017) show that indirect taxes such as VAT constitute a key tool in poverty alleviation in developing economies. The absence of consensus on this topic is the motivation for our research. Knowing the determining factors that reduce poverty is important and, in this context, tax design needs to be examined in order to find out whether it is a key instrument in alleviating poverty in developing countries.

1.3 Contribution to the literature

There is little research that analyses the link between taxes and poverty in developing countries. Salottia and Trecroci (2018), investigates the distributional impact of fiscal policy on inequality and poverty by employing data on a panel of 22 developed economies from 1970 to 2010. Investigating this relationship, they use Fixed Effect (FE), Random Effect (RE) and Generalized Method of Moments (GMM), combined with inequality data from the Standardized World Income Inequality Database (SWIID) and the Atkinson and Morelli dataset (2011). Furthermore, to measure poverty, the proportion of household living under 60% of the median equalised disposable income of the country as computed by Atkinson and Morelli (2011), were considered as poor. It has been found that the percentage of people living below this threshold has a negative link with fiscal instruments.

Salottia and Trecroci (2018) also discovered that in developed contries government expenditure on education exerts a negative and significant impacts on reducing poverty through redistribution of revenue. The limitation of their study is as follows: firstly, data on poverty is not accessible for every year in many cases. There are no data on poverty for countries such as Greece, Belgium, Ireland, Denmark, Iceland, Austria and New Zealand (Salottia & Trecroci, 2018). We conclude that their results may lead to bias. Secondly, the econometric approach (FE, RE and GMM) applied in their study is limited in assessing the long run relationship between taxes and poverty. Thirdly, they use 60% national median equivalised disposable income express by national currency as a poverty threshold. Therefore, household living under this threshold is regarded as poor despite this measure being used as a key indicator for eradication of poverty in the European Union until the adoption of

Europe 2020. This hides considerable variation across member states as it is computed using a weighted average national results which are limited given that these results are not a direct measure of poverty.

Contrary to the above authors, this study assesses: (i) the link between taxes and poverty using the data from a panel of 37 developing countries from 1996 to 2015. This is crucial as the main Sustainable Development Goal is to eradicate poverty by 2030. Therefore, policymakers need appropriate and specific policy recommendations adapted to the realities of developing countries. This differs from Salottia and Trecroci (2018) who use 22 developed countries as a spatial contribution. (ii), To estimate poverty, we used Headcount as a direct measure of poverty or incidence of poverty. The advantage of poverty incidence (headcount) is that despite the critique developed by Sen (1976) in Econometrica, this measure remains the most widely used, because of its simplicity.

In addition, Ravallion (1996) states that for a subject of such public interest as poverty measurement, formulae of other indexes such as poverty gap (PG), squared poverty gap (SPG), etc. may be hard to understand. To avoid overestimation or underestimation of the effect of taxes on poverty, this study uses the latest global poverty line of $1.90 per day in 2011 from Povcalnet which is the most recent dataset from the World Bank. (iii) Compared to the above study which uses FE, RE and GMM to control for endogeneity, the main contribution of this study is that we use panel cointegration technique to investigate the long run impact of direct and indirect taxes on poverty for 37 developing economies from 1996-2015.

The advantage of Panel Cointegration is that it allows us to examine the long term relationship among variables while letting the short term dynamic change between variables. However, Levine Lin and Chu (LLC) (2002), Im Pesaran Shin (IPS) (2003), Hadri (2000), Maddala and Wu (1999) and Breitung (2000) Panel Unit Root techniques are used to test for the unit root in each series as a precondition while Pedroni, Kao and Johansen-Fisher panel cointegration models are employed to test for the existence of cointegration among variables. To deal with serial correlation and endogeneity, this study applies Fully Modify Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) while Pooled Mean Group (PMG) is used to control for heterogeneity. Finally, we use the Dumitriscu-Hurlin for the causality test between variables.

1.4 Research questions

In order to investigate the association between taxes and poverty, this thesis will respond to the following questions:

- Is there a long run relation between direct and indirect taxes and poverty in developing countries?
- Are direct or indirect taxes effective in alleviating poverty in developing economies?

The response to the first question requires an application of the long run model for taxes and poverty employing panel cointegration.

To provide an answer for the second question, poverty will be regressed against taxes (taxes on goods and services, corporate income tax and personal income tax) and the control variables (GDP per capita and public spending on education).

1.5 Importance of the dissertation

Poverty is a common problem in developing countries. However, its reduction depends on the tax system of each country. This research is expected to ameliorate the understanding of the relationship between tax design and poverty reduction in developing economies. This is of considerable importance to scholars and policymakers, given that it extends the empirical literature on the subject and could promote social stability for developing countries.

This research highlights the importance of direct and indirect taxes in reducing poverty and the urgent need for developing countries policymakers to act and appropriate the full gains (knowledge) of the link between direct and indirect and poverty measurement. Maina (2017) shows that there is a global tendency of increasing VAT (indirect tax) as a percentage of total public revenue. This is due to two reasons: first, the challenge to tax individuals and companies, given the increased mobility of capital and labour. Second, while indirect taxes (because they are levied on consumption) impact a large number of people, personal income tax (PIT), which a direct tax, will impact a small number of people. It is envisaged that the results of this research could be important to policymakers in the attempt to alleviate poverty through tax design.

1.6 Structure of dissertation

This study is set out as follows. Chapter 2 describes poverty and taxes in developing countries. Chapter 3 provides an empirical review of the relationship between direct and indirect taxes and poverty.

Chapter 4 provides a brief explanation on data used in this dissertation and describes the methodology employed "panel cointegration". Chapter 5 presents the empirical findings of the study. Chapter 6 describes the conclusion and some policy recommendations.

CHAPTER 2. POVERTY AND TAXES IN DEVELOPING COUNTRIES

This chapter consists of two sections: Section 1 describes poverty in developing countries and section 2 presents taxes and poverty in developing countries.

2. 1 Poverty trend in developing countries

Poverty is a main challenge on the global agenda. In 1990, the main Millenium Development Goal was to halve extreme poverty rates by the year 2015. This goal has moved to Sustainable Development Goals (SDG). SDGs were adopted in 2015 by global leaders for the purpose of ending poverty by 2030 as a main goal. In addition, the World Bank has set two main objectives that are in alignment with the SDGs in eliminating extreme poverty by 2030, and promoting shared prosperity (Ferreira et al., 2015). Furthermore, development policies for any nation should be focused on ending absolute poverty, which demands both policies to redistribute income mobilised and economic growth (Bourguignon, 2004).

Over the past three decades, PovcalNet's data shows a general decrease in absolute poverty in developing countries. However, in only few countries poverty in 1981 was higher than in 2010: these incorporate some countries in Sub-Saharan Africa, Eastern Europe and Central Asia, and a few in Latin America and the Caribbean. In the 2000s, poverty reduction was more generalised except for 8 out of 121 economies (five in Sub-Saharan Africa) in which poverty rose between 1999 and 2010.

This data reveals that a percentage of the population living with less than $1.25 per day in the developing countries fell to 20.8% in 2010 from 52% in 1981. This indicates a downward trend of around 1 point per year. This is a period where extreme poverty was decreased drastically in a short run. However, this remarkable result must be put into perspective. (i), While four out of ten people have per capita consumption levels of less than $2 a day, one of every five people still lives in extreme poverty in the developing countries, using $1.25 per day. (ii), the rapid economic growth of China is key to this remarkable result. Excluding China, poverty reduction is less significant. Excluding China, it is clear that developing economies could achieve the MDG for poverty alleviation in 2015.

Using $1.25 a day as a poverty line (PL), the extreme poverty rate of each developing economy decreased to 19% in 2010 from 29.5% in 1981, which indicates a decrease of about a third of a point per year. This is less significant compared to one point per year of the global poverty rate. In comparison to the 1990s where poverty alleviation for a typical developing economy was around 1 point per year, poverty fell drastically between 2002 and 2008. The reduction in poverty becomes less

surprising when employing higher PLs. However, the incidence of poverty using $1.25 as a PL decreased 60% from 1981 to 2010, and fell 41% when employing $2 PL and 20% with the $4 PL. In fact, the MDG goal of reducing poverty by half ($1.25 per day) from the value in 1990 was already met in 2010, while the evaluation is non-identical when employing the $2 PL; compared to the value of 1990, poverty incidence in 2010 was around two-thirds.

Figure 1 plots poverty rates for developing economies in full and for six regions using $1.90 per day as PL. However, the graph shows that for all the developing world the rate of poverty reduced to 13% in 2013 from 54.7% in 1981. According to the estimation, it is going to decrease further to 11.9% in 2015. Despite this progress in poverty alleviation, Figure 1 also reveals that there are still vast regional discrepancies on the levels of progress in combating poverty at the global level. In the same context, Ravallion (2011) also noticed that that progress in combating poverty has been unequal over time and space. Furthermore, the comparison of progress in poverty alleviation between the six regions from 1981 to 2015 also indicates that there was a noticeable re-ranking. The striking reversal took place in the 1980s and 1990s. For instance, in 1981 the region with the higher poverty rate was the East Asia Pacific (EAP) at 80.5 %, followed by SA at 54.5% and Sub-Saharan Africa (SSA) at 49.2%. During the 1980s and early 1990s, The EAP had considerable number of extremely poor. However, by the early 1990s, SSA became the poorest region, despite a decrease in the rate of poverty during 2000, while the EAP recorded a pronounced fall in poverty rates. From 1981 to 2015, EAP recorded a considerable reduction in the poverty rate to less than 10% in 2011 from 80.5% in 1981 and is estimated to be less than 5% in 2015.

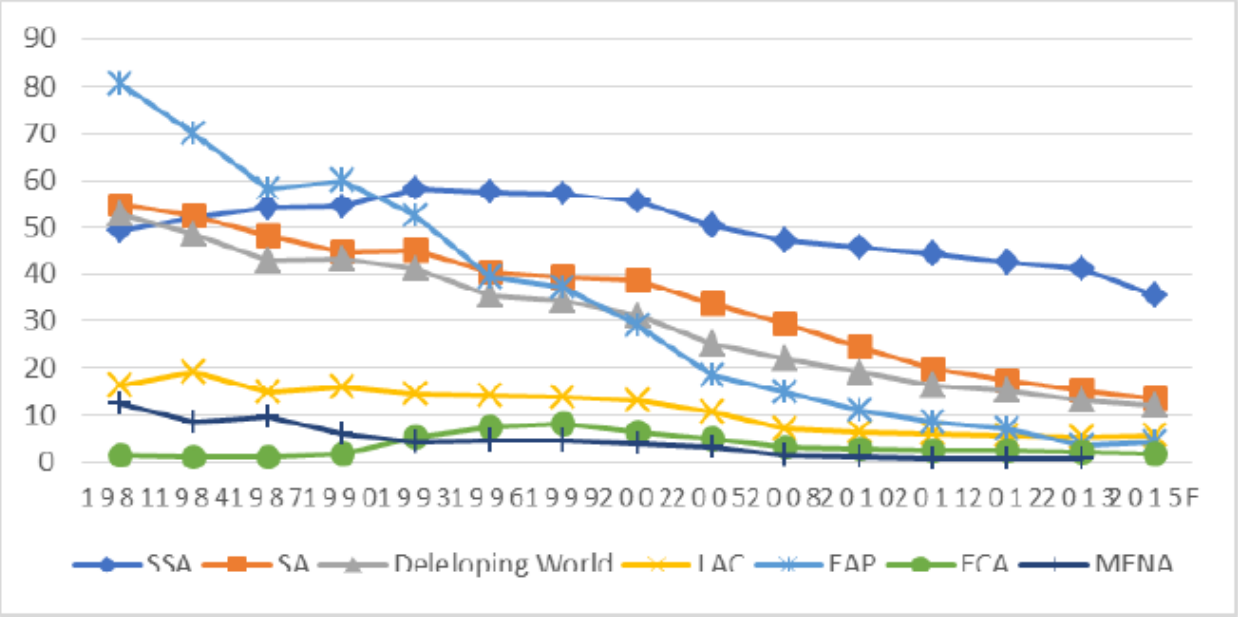

Figure 1: Regional Dynamics of poverty

Source: World Bank (2016)

Despite the downward trends observed in poverty in Fig. 1, regional disparities and poverty remain a challenge in developing economies. In order to eradicate this poverty by 2030, policymakers opt for taxation systems as a tool for eliminating poverty in developing economies. It is important to note that when investigating the effect of tax systems on poverty, it is necessary to distinguish between cash transfers (direct effect) from the non-cash transfers (indirect effect) received in the form of free public services in health and education. However, the effect of government expenditure on poverty also depends on the way it is financed (McKay, 2004). Direct taxes such PIT are considered to have negligeable effects on poverty, either because they are outside the direct tax system, or because households living below the poverty line are exempt. In most developing economies, a large proportion of tax revenue comes from VAT, which is an indirect tax. For example, around 60% of tax revenue comes from VAT in Latin America, compared to 40% in OECD economies (Goni, Lopez, & Serven, 2011). It is clear that indirect taxes can raise the poverty rate by increasing the prices of goods and services consumed by the poor. At the same time, monetary financing of public expenditure can also lead to higher inflation, which in turn has an adverse effect on poverty (Easterly & Fischer, 2001).

2. 2 Taxes and poverty in developing countries

Studies (OECD, 2008; IMF, 2014) demonstrate that fiscal instruments play an important role in reducing a country's poverty. However, public spending for provision of fundamental goods and services to lower income earners redistributes income and alleviates poverty. Given the global poverty rate, the role of progressive and regressive taxation in alleviating poverty becomes critical. Taxation is a key policy instrument in poverty reduction. Its capacity in affecting poverty alleviation has been broadly investigated. Scholars such as Okner, (1975) broadly debated whether taxation systems affects poverty positively or negatively.

In fact, taxes determine the disposable income available for household consumption, and thus affect poverty. However, disposable income does not take into consideration indirect taxes or the consumption tax (Karanfil & Ozkaya, 2013). This creates a limitation when using only disposable income in studying tax burdens and poverty, or income distribution. The efficacy of taxes in redistribution has been debated for years. Scholars such as Bird and Zolt, 2005, and Chu et al., 2000 demonstrated that the impact of taxes on poverty is insignificant in developing economies. In the following sections, we focus firstly on the impact of indirect taxes on poverty and secondly on the effect of direct taxes on poverty.

2.2.1 Effect of indirect taxes on poverty in developing countries

The World Bank, (2006) stated that developing economies are characterised by low levels of taxation, heavy reliance on regressive revenue instruments, and low coverage and benefit levels of transfer programmes. This limits the redistributive effect of taxation systems in developing countries. According to Baltagi et al., (2012), while the average tax ratios for developed countries is over 30% of GDP, that of developing countries (without emerging Europe economies) is between 15%–20 % of GDP. Tax mobilisation is not only lower but also more regressive than in developed economies. The challenges in applying more progressive taxation are linked to the larger size of informal sectors and higher degrees of self-employment. This limits the ability of the tax authorities to control the assets and income of taxpayers.

On the public spending side, in several developing countries public expenditure on social programmes is low, and contributions to social insurance programmes are reserved for public sector workers and high-income employees in the formal sector. All these factors lead to low redistributive effect of the

fiscal instrument on poverty in developing economies. Bahl and Bird (2008) show that while the share of personal income tax and excise duty has decreased, that of corporate income tax and VAT in OECD countries has increased. However, in developing economies, indirect taxes such as VAT play a key role.

Case of negative effect indirect taxes on poverty

Corriea (2007) demonstrated that a constant rate of tax on consumption, which is indirect taxes will ameliorate equity and standard of living, without transferring cash to the extremely poor household. He concludes that the more indirect taxes, such as consumption taxes, contribute to the public revenue, the more are the impacts on efficiency and living standards of the poor, through the provision of public goods such as education, health, public roads etc. In fact, this argument of consumption tax differs from the usual argument of indirect taxes (consumption taxes) as regressive.

Case of Positive effect of indirect taxes on poverty

Some studies (see for instance, Karanfil & Ozkaya, (2013)) have investigated the regressivity of indirect taxes on poverty. The results show that indirect taxes have a significant positive long-run effect on poverty. In other words, an increase in indirect taxes raises poverty. This means that a rise in indirect taxes reduces the purchasing power and the welfare of the poor. However, there is a heavy reliance on indirect taxes by policymakers to increase public revenue, given that they are easy to mobilise at a reduced political cost.

In comparison with progressive taxation, which is considered as equitable, – the share of income spent in taxes increases as incomes increase, and when the direct taxes are progressive, regressive taxation is regarded as inequitable. In other words, because the poor and the rich pay the same tax rate when buying goods and services, lower income earners spend a larger amount of their income on goods and services taxes (indirect taxes), as they consume more than they save compared to the rich. For example, consider two individuals paying R10 as the tax rate on tobacco products; one earns R100 and the other R1000. This illustration indicates that lower income earners spend more on tax, as R10 is 10% (10/100) of his income, compared to the higher income earners who pay only 1% (10/1000) (Esmaeel, 2013).

Case of Zero-rating and poverty

Low tax rates combined with high tax rate on luxury goods and exemptions on basic commodities may lead to the progressivity of consumption taxes. Studies (see for example, Casale, 2012; Saez, 2010 ;Karingi, et al., 2004) indicate that taxes on commodities can be employed to complement direct taxes in redistributing income in the short term. It has been found that zero-rating of some specified basic goods, mostly used by poor (basic food items and paraffin), benefits the poor. However, excise tax imposed on luxury goods such as watches, yachts, private jet planes, jewellery and expensive cars has the impact of raising equity. In another words, higher income earners are those who consume luxury goods and services and therefore, they pay the taxes. The revenue generated from those taxes can be used for the provision of public utilities to poor households. In Uganda for instance, zero-rating on certain goods has little fiscal effect on poverty. The argument is that an increase in tax burden through progressivity of VAT can be translated into appropriate service delivery for poor. In this context, non-exempted items are taxed more in order to avoid public revenue erosion.

2.2.2 Effect of direct taxes on poverty in developing countries

A tax system is a combination of public expenditure and tax policies in a legal and administrative framework. However, each element affects negatively or positively on poverty. A mixture of these policies determines who pays what, and how it may affect significantly poor households. In fact, a taxation system is rarely neutral; quite the contrary. In order to understand this, some concepts related to equity and efficiency and the characteristics of regressive and progressive taxation need to be grasped. A tax system is considered efficient if it causes interference in economic decisions that would be made if the tax did not exist. However, horizontal equity is when equals (those who have the same income) have the same fiscal treatment, while vertical equity means that non-equals should have different fiscal treatment. As with equity, a tax system is progressive when it is built on the theory that the more the income, the more tax should be paid. In other words, a taxation system is progressive if the higher income group pays more tax than the poor. It is regressive if the opposite is true. (Itriago, 2011). However, in this dissertation, direct taxes may impact poverty through PIT or CIT.

Personal Income tax and poverty

It is clear that direct taxes such as PIT are equitable because they are progressive by nature. This means that the rich, given that they save more than they consume, pay more tax than the poor. Then the revenue generated from those taxes is utilized, whether for cash transfers or for providing social

facilities such as food, housing facilities, clothing, education, healthcare etc. for the poor section of societies. (Esmaeel, 2013). Despite the fact that progressive taxation is more preferred to reduce poverty through income redistribution, it may discourage thework incentive, which impedes productivity and economic growth. (Djankov et al., 2010).

In developing countries, the effect of direct tax on poverty is negligeable due to following reasons: (i) the proportion of PIT is insignificant in developing countries, because it is levied in the formal sector. In most developing economies, the growth of the informal sector is a key factor that impedes the efficacy of PIT. It is likely that the informal sector reduces a considerable proportion of the tax base as it grows. Due to the lack of administrative capacity to identify employees or workers in the informal sector, the low, middle- and high-income earners are exempted from taxes. This reduces the role of a redistributive policy in developing world. (ii) the ineffectiveness of tax administration limits the capacity for raising sufficient public revenue though PIT. This is due to the lack of skill and resources to deal with income tax administration. (iii) poor governance and corruption render ineffective not only redistributiion effects but also the tax system. This limits the impact of redistributive policies. (Robinson, 2003; Kayaga, 2007; Bird & Zolt, 2005).

Corporate Income Tax and poverty

CIT can influence poverty in several dimensions. In this section, we discuss a few of them. The case of Indonesia in 2008 shows that the effect of CIT on poverty in developing countries depends on how large the extent of impact of shocks is on changing factors such as income and price levels in the economy. In fact, the extent to which the factors of income and price changes may impact headcount (incidence of poverty) depends on the sources of income and consumption patterns of people living in poverty. It may also depend on the sensitivity of PL in response to the change in prices.

Indonesia's case shows that CIT reduces poverty in the sense that first, a drop in the CIT decreases the prices of goods, wage raises and returns on capital. This entices investments and promote economic growth through job creation. Secondly, a reduction in prices of goods increases the buying power of the poor and keeps the PL at a low level, while rises in incomes increases the ability of the poor to consume more. This increases their welfare and reduces their poverty level. (Dartanto, 2012).

Pakistan's case reveals that taking into account tax evasion, CIT is ineffective in reducing poverty. A rise in CIT drastically decreases the capital formation rate, by decreasing the marginal product of labour, which leads to a negative income impact on all categories of society, specifically those living

in extreme poverty. It is important to note that the poor are the most affected, given that the largest part of their income originates fromtheir labour (Feltenstein,2017).

Education and poverty

A rise in coverage and better targeting of social policies was a sign of improvement in the 1990s. The actual conditional cash transfer programmes (CCTs) is a key constituent in ameliorating the distributive effect of government expenditure in developing economies. This programme transfers income to poor households, conditional on households investing in their children's human capital, such as education, health and nutrition. CCTs have been applied on a small scale in several regions of developing economies such as Sub-Saharan Africa (SSA) and Latine America Caribbean (LAC). (Garcia and Moore, 2012)

Education is important for ending poverty and for economic development. There is no economic development without education. A good education system not only improves economic development, but also productivity, and generates personal income per capita. Its impact is seen at the micro level of individual families whose combination makes up a nation.

CHAPTER 3: LITERATURE REVIEW

A literature review is key to any academic study. The need to discover what has been done in the field before initiating any study should not be neglected. This chapter offers an overview of the existing empirical literature on the effect of direct and indirect taxes on poverty in developing economies, and how this study contributes to the literature.

3.1 Empirical review

The empirical literature on tax design and poverty in developed and developing economies is well established. To investigate the effect of direct and indirect taxes on poverty in developing economies, this study focuses on redistributive taxation channels.

García and Giraldo (2018) use a Computable General Equilibrium (CGE) microsimulation method, which is a nonlinear model, to evaluate the effect of tax policy changes on growth, welfare and income distribution in Colombia. They employ household survey data. Their findings show that indirect taxes constitute a key instrument for the policymakers in Colombia, due to their effectiveness in collecting revenue and their decreased rate of evasion. It was also found that by applying zero tax on the poor, and reducing the tax burden of enterprises, investment can be stimulated. This may lead to economic growth and poverty alleviation. Their findings have shown that reduced indirect taxes such VAT give more disposable income to the consumers who buy products on which VAT is levied. This increases welfare through purchasing power and reduces poverty. Their study concludes that the best tax design is the one that compensate income to lower income earners.

Ahmed et al. (2010) assess Pakistan's tax reform and its effect on poverty and inequality using a CGE microsimulation technique. The results demonstrated that due to the structure of income earners in most developing economies, redistribution and a progressive tax system are hardly achieved. For instance, in Pakistan, more than 30% of people live under PL and 68% reside in rural zones. This makes the possibility of direct taxes less attractive. However, to meet public spending needs, taxes on goods and services (indirect taxes) account for a large share of total revenue given that they are hard to evade. Furthermore, it is concluded that an increase in taxes on goods and services leads to a fall in consumption levels of households. In fact, this is an indication of a decrease in wages, which in turn increases the national poverty incidence (Headcount) by 4.7%.

Amir, Adjaye and Ducpham, (2013) analyse the effect of the Indonesian income tax reform employing a CGE study from 1980 to 2008. This is done using a Social Accounting Matrix combined with the

National Input-Output Table. They also indicate that the reductions in PIT and corporate income tax (CIT) boost the economy. Their findings also show that their tax design leads to a small decrease in headcount (poverty incidence).

Feltenstein et al. (2017) investigate the poverty implication of alternative tax reform using a CGE microsimulation model that include the endogeneity of tax evasion. Their results demonstrate that an equal yield rise in corporate tax and sales rates produce different effects on poverty and consumption. They show that their findings should be taken with caution, due to the omission of sales and personal income tax evasion. Their findings also reveal that a rise to 45% from 35% in CIT leads to 21.1% of tax to Gross Domestic Product (GDP) ratio, which is specifically what has been collected by the 17% sales tax rate.

Immervoll et al. (2006) study the direct effect of tax burden and benefit payment s on poverty and inequality using the BRAHMS approach. This is a new tax-benefit microsimulation model, which gives entire information on tax paid and benefits received by households in a sample of the Brazilian total population. In addition, this study employs the 2003 PNAD dataset (National Household Survey) in Brazil. Their findings have shown that PIT renders the taxation system an ineffective redistributive instrument. For future policy recommendations, they suggest that it would be advisable to include other instruments in this simulation model, specifically non cash transfers such as education and health, and indirect taxes.

Okidi and Ssewanyana (2008) investigate the impact of tax system on poverty using UGATAX technique (a microsimulation of the Uganda Tax System) from 1999 to 2003. This technique captures direct and indirect taxes using a household as the unit of study. The study was implemented as UNHS I, Uganda national household survey of 1999/00. The main objective of UGATAX is to investigate the tax reform in the context of public revenue gain, the distributive effect and the impact on households living in poverty. Their findings support the argument that first; an increase in VAT from 17% to 20% holding other taxes constant will raise the tax burden of those below the PL. Each of the poor will pay an additional 243 Shilings due to an increase in VAT. But compared to the poor, non-poor will continue to pay more. Okidi and Ssewanyana (2008) advise to maintain the progressivity of VAT as an effective scope for upcoming moves in the tax structure. However, the restricted assumption is that a rise in tax burden will be converted into viable service delivery. Second, exemption (zero-rating) of most taxable items consumed by the poor would have small fiscal effect. In other words, the share of revenue forgone from the zero-rating is small. This policy was motivated

by a desire to initiate more progressivity in VAT, which is the principal component of indirect taxes. This indicates that due to their assumption of avoiding the erosion of revenue, non-exempted goods and services need to be highly taxed.

Maina (2017) tests the effect of consumption taxes on poverty and inequality in Kenya using two OLS models; first to show how consumption taxes effect inequality. Second to assess the impact of consumption taxes on the GDP per capita, which is a proxy of poverty. Maina (2017) uses 45 observations starting from 1970 to 2014. He also recommends that policymakers use fiscal policy as a tool to redistribute wealth. His study concludes that consumption taxes are regressive. The study also suggests the use of differentiated rate targeting the of poor. This means that lower taxation rates need to be applied on goods which the poor spend more of their income. By reducing indirect taxes such as taxes on goods and services may increase the purchasing power of the poor. This will increase their welfare and reduce their poverty.

Scholars such as Anderson et al. (2018) assess how government spending affects poverty using Cross-country Meta Regression Analysis (OLS, GMM, FE and RE and 2 SLS) to show a variety of findings from the linear to the nonlinear model. Their arguments reveal that fiscal instruments play a limited redistributive role in emerging economies, because: the less progressivity in a tax system, the lower the level of taxation and spending and the lower level of governance. They also find that compared to the estimates derived from 2 SLS, FE, RE and GMM, OLS estimates show that the link between poverty and public spending employing OLS is more negative.

Higgins and Lustig (2016) assess the relationship between poverty and taxes by comparing transfers and poverty before and after taxes. Their findings demonstrate that these comparisons combined with the measurement of progressivity and horizontal equity, may not to take into account a critical element: that a percentage of people in poverty become more poor (or those above the PL become poor) through the transfer and tax system. Their studies demonstrate with data that from 17 emerging economies out of 15, the tax system is progressive and decrease poverty through redistribution but in 10 of these emerging economies, one-quarter of people living in poverty receive less in transfers than the taxes they pay.

They called it "fiscal impoverishment"(FI). After measuring the fiscal gain of poor (FGP), they show that poverty gap changes may be decomposed into FI and FGP.

Using a comparative fiscal incidence study to investigate the effect of fiscal policy on poverty and inequality for 29 developing countries for 2010, Lustig (2017) employs three measures to assess the impact of tax systems on poverty: headcount, market income of the poor (which leads the poor to be net taxpayers to the tax system in cash terms), and fiscal impoverishment (FI). Their findings show that the share of social expenditure to GDP (redistributive effort) in each economy is firstly the key factor for fiscal redistribution, and the extent to which direct taxes are targeted to the rich and transfers are targeted to the poor. Lustig's (2017) results also support redistribution through public goods. For instance, the more these public services are used by the poor the more middle income classes and the rich are given poor quality public services. In this context, the middle classes and the rich may be resistant to paying the taxes required to ameliorate the quality of the public services if they move out of these system. Finally, the key finding in this study is that there is no confirmation of the "Robin Hood paradox" that redistribution from the rich to the poor increases inequality. This means that the redistribution policy reduces inequality.

Generally, there are very limited number of studies analysing the effect of direct and indirect taxes on poverty in developing countries. Against this above background, this study contributes to the literature by assessing the effect of direct and indirect taxes on poverty in 37 developing countries, using a panel cointegration model from 1996 to 2015. This model is useful in studying the long-run association between our variables. However, as macroeconomic variables are characterised by unit root in a long period (Nelson & Plosser, 1982), the precondition of this model is to test that all series are stationary. However, this shows that the results would be biased without panel unit root tests. This is contrary to other studies, which do not take into consideration the non-stationarity issue in the model. For example, Salottia and Trecroci (2018), who employ FE, RE and GMM and others (see for instance Lustig, 2017; Higgins & Lustig, 2016; Maina, 2017; Okidi & Ssewanyana, 2008; Immervoll et al. 2006; Amir, Adjaye & Ducpham 2013), who use different techniques such as a tax-benefit microsimulation model, CGE analysis, OLS, comparative fiscal incidence analysis etc., to test the link between taxes and poverty.

Contrary to the Salottia and Trecroci (2018), which tests the effects of fiscal policy on poverty for 22 developed economies, we use 37 developing economies to test this link. The argument is that given the higher the rate of poverty incidence in developing countries, policymakers need a suitable taxation system which reduces poverty in the context of developing countries. In addition, due to the

importance of the concept of poverty by the public, our study uses the most used and simple direct poverty measure, the "Headcount ratio,". This contrasts with Lustig (2017) and Salottia and Trecroci (2018). The former uses $1.25 per day in 2005 as a PL, while the latter uses the poverty measure developed by Atkinson and Morelli (2011). These authors regarded the proportion of households living below 60% of the median equivalised disposable income of the country as poor.

CHAPTER 4: METHODOLOGY AND DATA

This chapter analyses data and explains econometric techniques applied to investigate the effect of direct and indirect taxes on poverty in developing countries. It is structured as follows: Section 4.1 presents the data analysis while section 4.2 provides the model specification of poverty. Section 4.3 deals with estimation techniques.

4.1. Data analysis

4.1.1 Data collection and their expected signs

To investigate the effect of direct and indirect taxes on poverty, this research used a sample of 37 developing economies from 1996 to 2015. This sample was a rational choice for two reasons; first, it consists of developing countries which experience higher level of poverty. According to the World Bank, these countries are ranked as countries with low levels of total tax revenue as a percentage of their GDP. Second, the time period for this analysis begins from 1995, as it was the year for which the dataset was available for many developing economies. (See Appendix 1 for the list of developing countries).

The Taxes dataset (%GDP) employed in this research were obtained from UNU WIBER 2018 (GRD) while poverty incidence (Headcount) was obtained from the Povcalnet dataset. However, the data on GDP per capita and public expenditure on education (%GDP) were obtained from WBI. Due to the missing data issues observed in our sample, we used an interpolation technique to fill the gap in our variables.

However, while our dependent variable is the incidence of poverty (Headcount), there are several regressors such as CIT (tax_corp), PIT (tax_indiv) and tax on goods and services (tax_g_s). Public expenditure on education and GDP per capita were used as our control variables. The choice of these variables was based on the literature in the Chapter 2 literature review. Most scholars (see for instance Bird and Zolt 2005; Maina 2017), show that corporate tax (direct taxes) and tax on goods and services which include VAT (indirect taxes), are key factors in alleviating poverty in developing economies. These scholars found that poverty reduces as tax on goods and services and corporate increase. Therefore, the expected signs of tax on goods and services and corporate tax are anticipated to be negative. However, the marginal effect of personal income tax is anticipated to be positive or negative in developing economies. This means that in most cases personal income tax does not play a key role in reducing poverty in developing economies.

4.1.2 Descriptive statistics

Before analysing whether the direct and indirect taxes have impacted poverty in developing economies, we need to examine the distribution and the patterns of our dataset. There are 740 observations for 37 developing economies from 1996 to 2015.

Table: 1. describes the summary statistics focusing only on the means of independent and dependent variables employed in our thesis. The results from Table 1 reveal that on average, the incidence of poverty (Headcount) is 0.20 in developing countries with the standard deviation of 0.22. In addition, CIT has a mean of 2.45 in developing countries. A similar trend is observed on PIT where the mean is 2.48 while TGS remains high at 8.4 in developing countries. It was also found that 4.27, 4 and 9 represent the means of government spending on education, the GDP per capita, and the unemployment rate, respectively.

Table 1: Descriptive statistics

Var.	Obs.	Mean	Stand. Dev.
Headcount	740	0.20	0.22
Tax_corp	704	2.45	1.32
Tax_ind	712	2.48	2.09
Tax_g_s	729	8.09	3.47
Educexp	655	4.27	1.86
GDPpc	740	3.01	4.02

Fig.2 below plots the developing economies headcount, tax on goods and services, personal income tax and corporate tax over the period 1996-2015. Our data confirms that poverty incidence shows a moderate upward trend from 1996 to 1999, which is followed by a downward trend from 1999 to 2015. However, TGS which is the highest contributor in developing economies, has an increasing trend, while PIT and CIT show a moderate increase from 1996 to 2015. As shown in Fig.2, this increase in tax on goods and services plays an important role in poverty reduction in developing countries from 1996 to 2015.

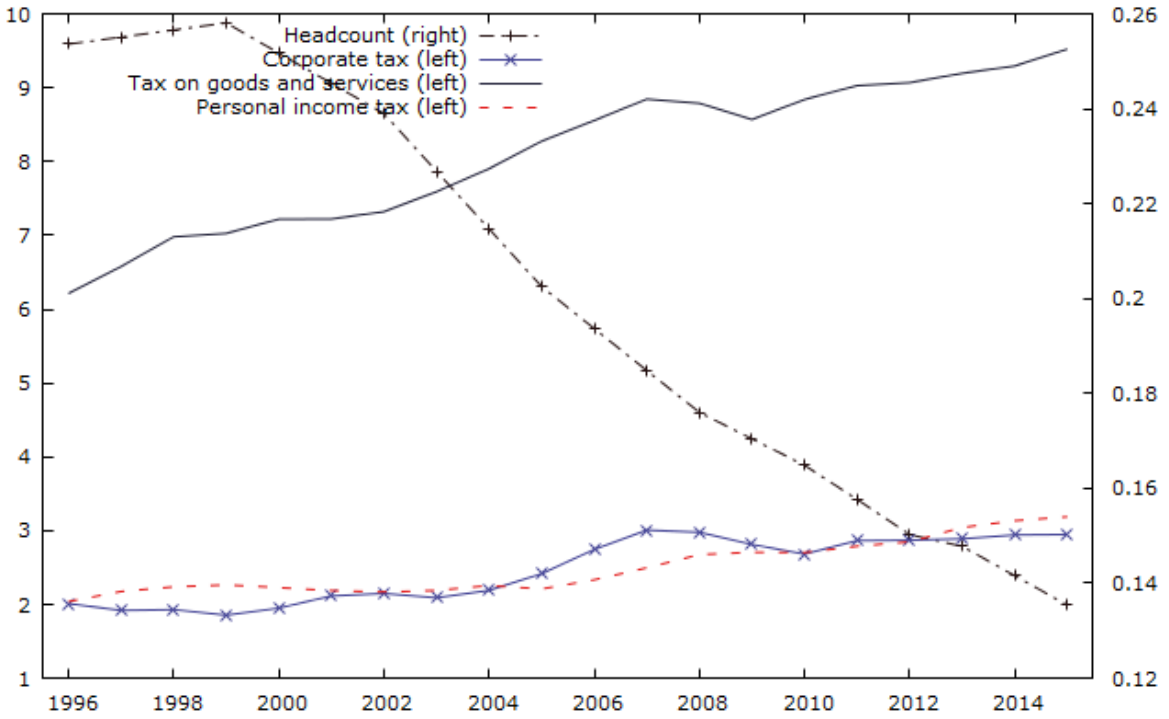

Fig 2. Presents developing economies headcount, tax on goods and services, corporate income tax and personal income tax for the period 1996-2015.

4.2 Model specification

In order to examine whether there is a long run association among our variables, we used an econometric specification incorporating poverty incidence (P), corporate tax (tax_corp), personal income tax (tax_indiv), tax on goods and services (tax_g_s), public expenditure on education (educ_exp) and GDPpc. Based on our research question, a conceptual model (regression functional form) was established where poverty incidence (P) is a function of tax_corp, tax_indiv, tax_g_s, educ_exp, GDPpc and idiosyncratic error term (e).

$$P_{it} = f(tax\_corp_{it};\ tax\_ind_{it};\ tax\_g\_s_{it};\ educ\_exp_{it};\ gdppc_{it};\ e_{it}) \quad (1)$$

Following Salottia and Trecroci (2018), a panel regression of Eq. (1) can be described as follows:

$$P_{it} = \alpha_0 + \alpha_1 tax\_corp_{it} + \alpha_2 tax\_ind_{it} + \alpha_3 tax\_g\_s_{it} + \acute{\beta}_j controls_{it} + \mu_{it} \quad (2)$$

where P_{it} is the poverty indicators (Headcount or incidence of poverty), *i* stands for country and *t* represents period of time. The regressors consist of tax_ind_{it} (personal income tax), tax_corp_{it}

(corporate tax) and $tax\_g\_s_{it}$ (tax on goods and services). The following control variables were added to complete our model: (i) public expenditure on education $(educ\_exp_{it})$; (ii) GDP per capita (GDP_{pcit}) and v_i , country-specific fixed effect, u_i is an error term.

4.3 Estimation Techniques

Our econometric technique was composed of 5 steps: (i) Panel unit root tests were used to ensure that all variables were in the same order of integration (ii) Panel cointegration tests were employed to test for the presence of cointegration using our variables in their first difference (iii) FMOLS and DOLS were utilised to estimate the long run relationship among variables and to deal with serial correlation and endogeneity issues (iv) PMG was used for robustness checking and to control for any heterogeneity problem (v) the Dumitrescu and Hurlin test was applied to test for the direction of short-run causality.

4.3.1 Panel unit root

According to Nelson and Plosser (1982), macroeconomic series are characterized by unit root when the time period of the sample is long in the panel. Therefore, it is critical to test for the integration order of the series before investigating any long term association. However, panel unit root techniques for all our series were imperative. It is important to note that panel unit root techniques include a multivariate analogue to standard univariate unit root techniques, incorporating KPSS, ADF and PP techniques. The major objective in expanding the application of simple time-series unit root techniques to employ the increase in sample size by pooling cross-sectional data to ameliorate the power of the techniques. In this study, five panel unit root techniques were analysed, namely: the LLC (2002), IPS (2003), Hadri (2000), Breitung (2000) and Maddala and Wu (1999) techniques.

A simple technique assumes the series of time on the cross section individuals i = 1, 2,3,4 ..., M over periods of time T are produced for a single i by a simple first-order autoregressive, AR (1), process:

$$y_{it} = (1 - \rho_i)\mu_i + \rho_i y_{i,t-1} + \varepsilon_{it} \quad (3)$$

t=1,2, 3, T and i=1,2, 3…, M

Where y_{it} represents the observed i-th individuals over period of time T. Error terms ε_{it} are independently and identically distributed (iid) for a unit *i* at the time periods T. ε_{it} describes white

noise for a unit *i* at the periods of time *T*. $\rho_i = 1$ for all i under the null of unit root and Eq. (3) can be described as the Augmented Dickey-Fuller (ADF) specification:

$$\Delta y_{i,t} = \alpha_i + \Phi_i y_{i,t-1} + \sum_{j=1}^{q_i} \gamma_{ij} \Delta y_{i,t-j} + \varepsilon_{i,t} \quad (4)$$

Where y_i describes coefficients to be determined (estimated) for the i[th] individual and $\phi_i = (\rho_i - 1)$, $\alpha = (1 - \rho_i)$, q_i represents the number of lagged terms for the i[th] individual $\Delta y_{i,t} = y_{i,t} - y_{i,t-1}$ and all other parameters are as previously defined.

As a first step, this dissertation used a stationarity test to check if the variables incorporated in the model had the same order. To test the integration of order, this study employed stationarity tests established by LLC, IPS (2003), Breitung (2000), Hadri (2000), and Maddala and Wu (1999). From each method, this dissertation assessed for unit root tests in the panel by employing five types of techniques. Based on the ADF technique, the LLC technique is the most employed technique in panel settings.

4.3.1.1 Levin, Lin and Chu (LLC) technique

This panel unit root technique was developed by Levin and Lin (1992) and formalised by Levin, Lin and Chu (2002). This technique allows the time trend, intercept, higher-order autocorrelations and residual variance to vary across the units.

The LLC technique is founded on a pooled panel estimator which assumes a common $\phi_i = \phi$ but permits q_i to change across the cross-sectional units. This also demands a common sample size from the independently generated time series. This technique can be considered as a pooled ADF technique with different lag lengths across the units of the panel. The major disadvantage of this technique is that it imposes a cross-equation restriction on the first-order autocorrelation coefficients. According to LLC, the alternative and null hypothesis are as follows:

$$H_0 : \phi_1 = \phi_2 = \cdots = \phi_M = 0$$

$$H_0 : \phi_1 = \phi_2 = \cdots = \phi_M < 0$$

According to LLC, each cross sectional unit has a unit root under the null hypothesis, while each cross-sectional unit has no unit root under the alternative hypothesis.

4.3.1.2 Im, Pesaran and Shin Technique

The IPS (2003) technique is established as taking into account the main limitation of the LLC technique, where it is presumed that all unit AR (1) series have the same autocorrelation coefficient. It permits for individual processes by allowing ϕ_i to change across the cross-sectional units. This technique starts by establishing a separate ADF regression for a single cross-sectional unit in Eq. (4). According to IPS, the alternative and null hypothesis are as follows:

$$H_0 : \phi_i = \phi = 0 \; for \; \forall \; i$$

$$H_0 : \phi_i < 0 \; for \; i = 1,2, \ldots\ldots, M_1 \; and \; \phi_i = 0 \; for \; i = M_1 + 1, \ldots, M$$

According to IPS, all cross-sectional units have a unit root under the null hypothesis while at least one unit is stationary under the alternative. This shows that IPS is different from the LLC technique which assumes that all units have no unit root under the alternative hypothesis. The IPS technique is founded on M independent tests on M cross-sectional units while the LLC technique combines the test statistics. However, the random errors, $\mathcal{E}_{i,t}$, are presumed to be serially correlated with different variances across a single unit of a cross-section, and different serial correlation properties. The key of this technique is founded on a group-mean t-bar statistic where the t-statistics are obtained from a single ADF technique and averaged across the cross-sectional units over time (panels). Under the null hypothesis, the factors of adjustment are employed to standardise the T-bar statistic into a standard normal IPS W-statistic.

4.3.1.3 Hadri technique

The Hadri (2000) panel unit root technique is similar to KPSS unit root technique with the null of stationarity in any of the units in the panel. As KPSS unit root technique, this technique is founded on the residuals obtained from individual OLS regressions of $y_{i,t}$ on a constant or a constant and a trend. The statistic test is distributed as standard normal, under the null hypothesis. The error process can be presumed to be heteroskedastic across the cross-sectional units or homoscedastic across the panel. However, this technique presents two Z-statistics. The first Z-statistic is obtained from the LM statistic where the residuals derived from the ADF regression are connected with the homoscedasticity assumption across the panel and the second employs the LM statistic that is heteroscedasticity consistent.

4.3.1.4 Breitung technique

Breitung (2000), developed a pooled technique that does not necessitate bias correction factors. This is attained by a relevant variable transformation. The IPS technique loses the power given the bias correction when individual-specific trends are incorporated into the model. Breitung (2000) suggests another unit root test which has more power than the IPS test and can control for the loss of power. The null for this technique assumes a non-stationarity difference in the panel series, while the alternative assumes that the panel series are stationary.

4.3.1.5 Maddala and Wu technique

Compared to the IPS technique based on an asymptotic and parametric test, Choi (2001) and Maddala and Wu (1999) proposed a non-parametric focusing on the Fisher (1932) technique. They incorporated the P-values from the individual stationarity technique. The importance of this technique is that its value is not based on different lag lengths in the individual ADF regressions.

The t-statistic is given by:

$$P_{MW} = -2 \sum_{i=1}^{N} log\pi_i \quad (5)$$

According to MW test, if the t-statistics is continuous: Firstly, the level of significance, π ($p-$values or P_{MW}) of the t-statistics is uniformly and independently distributed between [0, 1] under the null. Secondly, -2 log π has a distribution of X_2^2. Thirdly, under the null hypothesis, $-2 \sum_{i=1}^{N} log\pi_i$ has a distribution of X_{2N}^2 where the degree of freedom is described by 2N. The null is non-stationary for each series, i.e. H_0: $\rho_i = 0$ for each i. However, not all series are non-stationary under the alternative hypothesis i.e. H_1: $\rho_i < 0$ for i = 1,….., N_1 and $\rho_i = 0$ for i = N_1 +1,….., N.

4.3.2 Panel Cointegration Technique

After testing for stationarity, the following step is to study the long term link among variables employing the Pedroni (1999), Kao (1999) and Fisher/Johansen cointegration methods. Breitung and Pesaran, (2005) demonstrated that the cointegration technique which controls for the existence of long-term association among integrated variables is a common instrument in the literature.

According to Pedroni, (2004), several techniques have only small impact when applied to single unit time series available after World War II. Because of this issue, it has been found essential to extend the sample by incorporating additional cross-sectional data and investigating cointegration associations in a pooled panel of time series.

Furthermore, by employing cointegration techniques, variables need to be measured in levels. Therefore, our technique may be viewed as more precise way for analysing the presence of a long-term association among variables. In the following section, we describe three fundamental panel cointegration techniques: Pedroni (1999, 2004), Kao (1999) and Maddala and Wu (1999).

4.3.2.1 Pedroni Technique

Engle and Granger (1987) established the cointegration technique for individual unit time-series. This technique is founded on the analysis of residuals of the regression employing I (1) variables. For these variables to be cointegrated, the necessary condition is that the residuals should be I (0). However, there is no cointegration if the residuals are I (1) and therefore no long-term equilibrium relationship among the variables. Pedroni (1999) expand the Engle-Granger based on the residuals technique to the panel setting. This technique needs to determine the residuals from the regression of the hypothesised cointegration. Therefore, consider the following regression:

$$y_{it} = \acute{\delta}_i d_t + \beta_i x_{it} + e_{it} \quad (6)$$

where t =1…...T stands for the time period index and i = 1…., N describes the cross-sectional units. The term d_t contains the deterministic components, which can be explained in three types of specifications. $d_t = 0$ when no deterministic trend is incorporated in the equation (6). While $d_t = 1$ implies an individual constant trend when y_{it} is modelled, $d_t = (1, t)'$ implies time trend and an individual constant when y_{it} is modelled. It is important to note that parameter δ_i controls for deterministic trend and individual specific fixed effects. In addition, the slope coefficients can change across units. $y_{it} and\ x_{it}$(variables of interest) are presumed to be I (1) for single cross-sectional individual i. According to the Engle-Granger technique, error term e_{it} should also be I(1) under the null of no cointegration. From the transformation of the equation (1), we can obtain first the following residuals equation: $\hat{e}_{it} = y_{it} - \hat{\delta}_i' d_t - \hat{\beta}_i x_{it}$ and examine if the residuals are I (1) by running an additional regression for each cross-sectional unit:

$$\hat{e}_{it} = \rho_i \hat{e}_{i,t-1} + \mu_{it} \quad (7)$$

$$\hat{e}_{it} = \rho_i \hat{e}_{i,t-1} + \sum_{j=1}^{p_i} \psi_{it} \Delta \hat{e}_{i,t-j} + v_{it} \quad (8)$$

where $E[u_{it}, u_{js}] = 0 \; \forall s, t, i \neq j$ and $E[v_{it}, v_{js}] = 0 \; \forall s, t, i \neq j$ Therefore the cross-sectional units are presumed to be independently and identically distributed, for instance the Pedroni technique does not control for cross sectional dependency.

However, this technique proposes seven different statistics to test for the null of no cointegration $\rho_i =$ 1. However, the first four are considered as within-dimension or panel cointegration statistic tests while the last three are regarded as between dimension or group mean panel cointegration statistics tests. The null of no cointegration can only be rejected when the majority of statistics out of seven are significant at the 5% level. The Pedroni test controls for heterogeneity across the units in the panel constitute an improvement over other techniques.

A common autoregressive coefficient is assumed when the first four statistics (within-dimension) test for the null hypothesis $H_0: \rho_i = 1$ for all cross-sectional units i, against the alternative $H_i^p : \rho_{i=} \; \rho < 1$ for all units while the autoregressive coefficients are allowed to change between the units when the three remaining statistics (between-dimension) test for the null hypothesis $H_0: \rho_i = 1$ for all cross-sectional units i, against the alternative $H_i^p : \rho_{i=} \; \rho < 1$ for all units. According to Breitung and Pesaran, 2005, the Pedroni technique belongs to the so-called first generation panel cointegration technique.

4.3.2.2 Kao Cointegration Technique

Despite Pedroni (1999) and Kao (1999) extending the residual's cointegration technique established by Engel and Granger (1987), Kao (1999) proposes ADF and DF (Dickey-Fuller) type stationarity technique under the null hypothesis of no cointegration.

The Kao-DF test can be written as follows:

$$y_{it} = \alpha_i + \beta x_{it} + e_{it} \tag{9}$$

$$y_{it} = y_{it-1} + u_{it} \text{ and } x_{it} = x_{it-1} + \varepsilon_{it} \tag{10}$$

Where *i* = 1,…N, t = 1,…T. α_i describes the fixed effect varying across the units and β represents the slope of the parameter. x_{it} and y_{it} describe random walk. It appears that the residual series e_{it} should be nonstationary under the null hypothesis of no cointegration. The estimated residuals from the Kao-DF technique follows the following equation:

$$\hat{e}_{it} = \rho \hat{e}_{it} + v_{it} \tag{11}$$

Where e_{it} represents the estimated residual.

For the ADF test from Kao, the estimated residual is given by:

$$\hat{e}_{it} = \rho\hat{e}_{it} + \sum_{j=1}^{p} \gamma_j \Delta\hat{e}_{it-j} + v_{itp} \quad (12)$$

Where p represents the number of lags in the ADF test and $\hat{e}_{it}$ denotes the estimated residual. To examine whether y_{it} and x_{it} are cointegrated variables based on ADF and DF technique, the null and alternative hypothesis may be written as $H_0: \rho = 1$ and $H_1: \rho < 1$.

4.3.2.3 Fisher/Johansen Cointegration Technique

Maddala and Wu (1999) used Fisher's (1932) technique suggestion by combining individual techniques. They suggest an alternative approach to test for cointegration in the panel by combining individual cross-sectional unit techniques for cointegration to obtain a test statistic for the full panel. To determine the existence of cointegration, this test proposes two different statistics: maximum eigenvalue statistics and trace statistics. While the maximum eigenvalue statistics techniques for exactly r cointegrating vectors against the alternative hypothesis of r+1 cointegrating vectors, trace statistic tests for at most r cointegrating vectors among a system of N > T time series. However, if the p-value is π_i from each individual cointegration technique for the cross-sectional i, the null for the full panel, $-2\sum_{i=1}^{N} log\pi_i$ is distributed as X_{2N}^2. Note that while 2N is the degree of freedom, X^2 is the value reported in Eviews based on Mc Kinnon-Haug-Michelis (1999).

In summary, theKao and Pedroni cointegration tests are one way cointegration and both are based on the residual while the Johansen-Fisher cointegration test is based on a system cointegration technique for the full panel.

4.3.3 FMOLS and DOLS

Given that a cointegration link among variables holds, this thesis assesses the long-term association among variables. Despite the fact that the OLS technique leads to spurious parameters in the presence of cointegration, there are a number of econometric techniques available for investigating the cointegration vector in cross-sectional units over time: the FMOLS technique and DOLS technique. DOLS was established by Chiang and Kao (2000) to produce best estimates when it comes to panel cointegration. However, one main limitation of DOLS is that it does not take into consideration the

possible correlation between the first difference of independent variables and the errors term (serial correlation problem).

To solve this problem, FMOLS was established by Pedroni (2001) for cointegrated panels dealing with serial correlation and endogeneity. It was also found that the FMOLS method can offer consistent estimates in small samples when endogeneity may be a concern. This means that direct and indirect taxes may impact poverty, but the desire of the policymakers to reduce them can lead to fiscal policy decisions, and establishing a possible mutual link between direct and indirect taxes and poverty.

The cointegrated system is expressed as follow:

$$y_{it} = \alpha_i + \beta_i x_{it} + \mu_{it} \quad (13)$$

$$x_{it} = x_{it-1} + v_{it} \quad (14)$$

Where t and i stand for time and country, respectively, y_{it} represents headcount (incidence of poverty), x_{it} is a vector of regressors of order one; I (1) and the vector error process $w_{it} = (u_{it}, v_{it})$ is stationary with asymptotic covariance matrix Ω_t. y_i *and* x_i are considered as cointegrated for each unit of the panel with cointegrated vector β_i on the condition that y_{it} is I (1). α_i allows cointegrating association to incorporate individual-specific effects.

Fully Modified OLS is expressed as follows:

$$\hat{\beta}_{iFMOLS} = N^{-1} \sum_{i=1}^{N} (\sum_{i=1}^{T} (x_{it} - \bar{x}_i)^2)^{-1} (\sum_{i=1}^{T} (x_{it} - \bar{x}_i) y_{it}^* - T\hat{\gamma}_i) \quad (15)$$

Where:

$$y_{it}^* = (x_{it} - \bar{x}_i) - \frac{\hat{\Omega}_{21i}}{\hat{\Omega}_{22i}} \Delta x_{it}$$

$$\hat{\gamma}_i = \hat{\Gamma}_{12i} + \hat{\Omega}_{21i}^0 - \frac{\hat{\Omega}_{21i}}{\hat{\Omega}_{22i}} (\hat{\Gamma}_{22i} - \hat{\Omega}_{22i}^0)$$

$\hat{\gamma}_i$ is a term which correct the impact of serial correlation caused by heterogeneity dynamics in the short run process which determines y and x (see for instance Harris and Sollis, 2003), $\hat{\Gamma}$ and $\hat{\Omega}$ represented covariance and sums of covariance from the long-term covariance matrix for the equation 15. From the equation 15, the Dynamic OLS is expressed by:

$$\hat{\beta}_{DOLS}^* = N^{-1} \sum_{i=1}^{N} (\sum_{t=1}^{T} z_{it} z_{it}^i)^{-1} (\sum_{t=1}^{T} z_{it} y_{it}^*) \quad (16)$$

Where the vector of the independent variables is represented by z_{it} which is a 2(k+1)1. One of the weaknesses of employing the Dynamic OLS technique is that it reduces the degrees of freedom by incorporating leads and lags (see Maeso-Fernandez et al, 2004).

The above author also indicates that the Fully Modified OLS technique requires less assumptions compared to the Dynamic OLS technique. Therefore, FMOLS leads to consistent results in comparison with DOLS. This means that for robustness checking we ran both regressions (FMOLS and DOLS) but our focus was on figures reported by FMOLS rather than by DOLS.

4.3.4 Pooled Mean Group (PMG)

After applying DOLS and FMOLS which deal with endogeneity and serial correlation issues, this thesis use the PMG technique for robustness checking, not only to examine the long-term link among the variables but also to control for the heterogeneity problem. This technique (see for instance Im, Pesaran and Shin, 1999) restricts the coefficient in the long run to be the same, and allows for heterogeneity in error term correction, short run coefficients and intercepts. There are two major requirements for the application of this technique: (i) It has to be a long-run association among variables of interest, and (ii) for the resulting residual to be serially uncorrelated, the dynamic specification of the model should be sufficiently augmented. According to Pesaran et al. (1999) PMG is an ARDL technique to long-term modelling.

Although PMG addresses the small sample bias, it can also yield consistent results on whether the variables of interest have a unit root or not, or are mutually cointegrated. To conform with the requirements of inference and standard estimation, a long-term regression equation is included into an autoregressive distributed lag; ARDL (*p, q*) model. Following error correction structure, this equation is expressed by:

$$\Delta y_{it} = \sum^{p-1} \gamma_j^i \, \Delta y_{it-j} + \sum^{q-1} \delta_j^i \, \Delta x_{it-j} + \phi^i \left[y_{it-1} - \left(\beta_0^i + \beta_1^i p_{it-1} \right) \right] + \varepsilon_{it} \qquad (17)$$

where, *t* and *i* stand for time and country, respectively. y_{it} is the poverty incidence (Headcount), x_{it} represents taxes and p_{it} is a set of control variables: public expenditure on education and GDP per capita. While $\beta_0^i \ and \ \beta_1^i$ represent coefficients in the long run, $\gamma \ and \ \delta$ represent the coefficient in the short run, Σ stands for time-varying disturbance and δ is the speed of convergence to the long-term association.

4.3.5 Dumitrescu and Hurlin Causality Technique (Short Run)

In addition to PMG, the Dumitrescu and Hurlin causality technique was developed to investigate the short run causality among variables. According to Granger (1969) the causality technique for two variables (M and N) is given by the following equations:

$$\mathrm{M}_t = \alpha_1 + \sum_{i=1}^{n} \beta_{1i}\, \mathrm{N}_{t-i} + \sum_{i=1}^{n} \beta_{2i}\, \mathrm{M}_{t-i} + e_{1t} \quad (18)$$

$$\mathrm{N}_t = \alpha_2 + \sum_{i=1}^{n} \beta_{3i}\, \mathrm{N}_{t-i} + \sum_{i=1}^{n} \beta_{4i}\, \mathrm{M}_{t-i} + e_{2i} \quad (19)$$

Where α_1, α_2 and from β_1 to β_4 represent estimating parameters, e_{1t} and e_{2t} denote error term, and n is the number of lags. If variable M does not cause N, the parameters of N over the lagged M are mutually nil.

Dumitrescu and Hurlin (2012) established the Granger causality technique in panel data by including cross-sectional entities. They observed two stationary variables z and h over the period of time T and individuals N. The equation is developed as follows:

$$\mathrm{Z}_{i,t} = \nu_t + \sum_{c=1}^{c} \mu^{(c)}\, \mathrm{Z}_{i,t} + \sum_{c=1}^{c} \beta^{(c)}\, h_{i,t-c} + \mu_{i,t} \quad (20)$$

Where μ represents the error term.

CHAPTER 5: EMPIRICAL RESULTS

This chapter comprises five sections. Section 1 and 2 describe the panel unit root and panel cointegration empirical findings respectively. Section 3 and 4 provide FMOLS and DOLS and the PMG empirical results respectively. Finally, section 5 presents Dumitrescu-Hurlin panel causality results

5.1 Stationarity Test Results

The findings of the panel unit root tests based on techniques developed by LLC, IPS, Breitung, Hadri and Maddala and Wu are described in Table 2. For the majority of the variables in level, the null is rejected except the Breitung which exhibits the unit root for Headcount and Tax_g_s. It was also found that for the MW-PP Fisher technique, Educ_exp shows unit root at the 5% significance level form. By applying the first difference as shown in Table 3, the null is rejected at the 5% significance level for the majority of the variables. Therefore, by converting the levels into first difference form we conclude that all the stationarity techniques exhibit stationarity for all variables in first difference. This demonstrates that Headcount, Tax_corp, Tax_g_s, Tax_ind, GDPPC, Educ_exp are *I* (1).

Table 2: Stationarity tests results (level)

Null: nonstationary						Null: stationary	
Variables	Methods						
	LLC test	Breitung	IPS	ADF-P	PP-F	Hadri z-stat	Heter z-stat
Headcount	-8.5247***	9.3361	-1.8558**	170.934	138.284***	15.1113***	11.9729***
	0.0000	1..0000	0.0317	0.0000	0.0000	0.0000	0.0000
Educexp	-2.4434***	1.5696	-0.1405	82.1391	87.9717	8.6016***	6.8300***
	0.0000	0.9418	0.4441	0.2419	0.1277	0.0000	0.0000
GDPPC	-14.7697***	-11.063***	-12.3319***	282.5770	292.975***	2.9176***	2.2034**
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0018	0.0138
Tax_corp	-2.2012**	-1.4657*	-1.05048	92.2257	97.0.244**	11.7398***	10.6592***
	0.0139	0.0714	0.1467	0.0744	0.0376	0.0000	0.0000
Tax_ind	1.0867	0.8056	2.4734	59.2970	60.1494	14.0507***	10.6079***
	0.8614	0.7898	0.9933	0.8932	0.8775	0.0000	0.0000
Tax_g_s	-3.3319***	-0.6525	-0.6480	77.2590	78.1108	14.2702***	11.2104***
	0.0004	0.2570	0.2585	0.3750	0.3496	0.0000	0.0000

Notes: p-values are in parentheses. ***, ** and * demonstrate that the null is rejected at 1%, 5% and 10%, respectively. The majority of techniques assume asymptotic normality while the probabilities for the Fisher-type technique are computed employing an asymptotic Chi-square distribution.

Table 3: Stationarity tests results (First Difference)

Null: nonstationary					Null: stationary		
Variables	Methods						
	LLC test	Breitung	IPS	ADF-P	PP-F	Hadri z-stat	Hete z-stat
Headcount	-8.5247***	-3.8036***	-4.6697***	170.934***	138.284***	15.1113***	11.9729***
	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
Educ_exp	-15.3726***	-6.2229***	-12.9063***	293.844***	556.662***	8.6016***	6.8300***
	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
GDPPC	-2.4434***	-11.063***	-12.3319***	282.577***	292.975***	2.9176***	2.2034**
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0018	0.0138
Tax_corp	-19.1730***	-7.7581***	-16.2677***	377.502***	522.558***	11.7398***	10.6592***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tax_ind	-22.0512***	-10.6338***	-17.5396***	440.408***	684.942***	14.0507***	10.6079***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tax_g_s	-20.8804***	-9.5037***	-18.3399***	415.106***	447.358***	14.2702***	11.2104***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: p-values are in parentheses. ***, ** and * demonstrate that the null is rejected at 1%, 5% and 10%, respectively. The majority of techniques assume asymptotic normality while the probabilities for the Fisher-type techniques are computed employing an asymptotic Chi-square distribution.

5.2 Panel Cointegration Results

Given that the majority of variables are *I* (1), the following step was to perform the cointegration test employing the series at first difference to test for the presence of long run links among our variables. In this study, we used the Pedroni, Kao and Johansen-Fisher cointegration techniques to provide evidence for the presence of cointegration between variables. Table 4 below presents the cointegration test results from seven statistics of Pedroni. The findings from Table 4 show that in all cases, we accepted the null of no cointegration among the variables at the 5% level of significance, except the Group PP-Statistic which rejected the null at the 5% significance level form. Pedroni's results reveal that variables have no cointegrated link in the long run, given that six out of seven statistics accepted the null of no cointegration. Using Pedroni's cointegration technique, we concluded that the variables had no relation in the long run.

Despite no evidence of cointegration among variables using the Pedroni cointegration technique, this dissertation employed the Kao cointegration technique to test for the presence of a long-run association between variables. The results in Table 5 below confirm that at the 5% level of significance, we rejected the null of no cointegration, given that the p-value is 0.0000, which is highly significant. Using the Kao cointegration technique, we concluded that there is strong evidence of a long-run link between variables. For robustness checking, we conducted the Johansen-Fisher panel cointegration

technique to confirm the presence of cointegration. The findings in Table 6 below show that in both cases of the Fisher max-eigenvalue and the Fisher trace approaches, there is a long-run relation between our variable,s as all our p-values are highly significant.

Note that the Kao and the Pedroni panel cointegration techniques are constructed on the Engle and Granger (1987) approach, which is limited when assessing the properties of cointegration for an n-dimensional vector of I (1) series, where a number of cointegrating links may appear. Since our study used several variables in the system, there was a possibility of obtaining more than one cointegrating association established by these variables. Compared to the Kao and Pedroni panel cointegration approaches, the Johansen-Fisher panel cointegration approach has an advantage of relaxing the assumption of a single cointegrating vector between variables.

Finally, we concluded that there is an existence of cointegration between the variables, as the majority of the techniques (Kao and Johansen-Fisher panel cointegration techniques) confirmed the long run relation among variables.

Table 4: Pedroni Panel Cointegration Results.

Alt.Hypo: Within-Dimension				
	Stat	Prob.	Stat	Prob.
v-Stat	-3.668437	0.9999	-2.109880	0.9825
Rho-stat	4.819368	1.0000	4.745114	1.0000
PP-stat	-0.498483	0.3091	-0.975332	0.1647
ADF-stat	-3.077107	0.9990	-1.872575	0.9694
Alt. hyp: between-Dimension				
	Stat	Prob.		
Rho-stat	7.601127	1.0000		
PP-stat	-2.355430	0.0093		
ADF-stat	1.481991	0.9308		

Notes: ***, ** and * demonstrate that the null is rejected at 1%, 5% and 10%, respectively. The null is that series are not cointegrated. Trend assumption: No deterministic trend. User-specified lag length: 1. Newey-West automatic bandwidth selection and Bartlett Kernel.

Table 5: Kao Panel Cointegration Results.

	t-stat	Prob.
DF	-2.191263	0.0142

Notes: The null is that series are not cointegrated.: ***, ** and * demonstrates that the null is rejected at 1%, 5% and 10%, respectively.
Trend assumption: No deterministic trend. User-specified lag length: 1 and Newey-west automatic Bandwidth selection and Bartlett Kernel.

Table 6: Johansen Fisher Panel Cointegration Results

No of CE.	Fisher Stat-From Trace test.	Prob.	Fisher Stat-From Max-Eigen test	Prob.
None	312.2	0.0000	170.1	0.0000
At most 1	878.2	0.0000	656.4	0.0000
At most 2	783.1	0.0000	617.1	0.0000
At most 3	425.1	0.0000	312.2	0.0000
At most 4	224.6	0.0000	184.6	0.0000
At most 5	126.9	0.0000	126.9	0.0000

Notes: ***, ** and * demonstrate that the null is rejected at 1%, 5% and 10%, respectively. Trend assumption: no deterministic trend. The null is that series are not cointegrated. Probabilities are computed using asymptotic chi-square distribution. Lags interval: 11 in first Difference. Trend assumption: Linear deterministic trend.

5.3 FMOLS and DOLS Results

This research employed DOLS and FMOLS techniques to study the long-term link between variables as seen in Eq. (5). Table 7 shows the findings from the FMOLS and DOLS estimation: As reported in the Table 7, both FMOLS and DOLS techniques demonstrated generally consistent findings regarding long term association among series and the findings are almost the same for FMOLS and DOLS. Because FMOLS require less assumptions and lead to consistent results, our focus was on FMOLS while interpreting the results. However, Table 7 demonstrates that poverty incidence has a negative relationship with corporate taxes, taxes on goods and services, and public education expenditures, and that they are statistically significant, except Tax_indiv (personal income taxes), which is insignificant in developing countries.

However, Table 7 also shows that a 1-unit rise in Corporate Tax reduces the poverty rate by 0.023 in a long-run. This could mean that tax mobilised from corporate tax is used through a redistribution policy to provide cash transfers that raise the living standard of the poor. The effect of corporate tax on poverty is small (0.023) in developing economies due to the ineffectiveness of the redistribution policy, which is based on cash transfers targeting the poor, and direct taxes that target the rich. These results conform with the result of Lustig (2013), who demonstrated that while direct taxes such as corporate taxes are progressive, the distributive effect is small due to the fact that direct taxes such as corporate taxes as a percentage of their GDP, are small. However as expected, the effect of poverty alleviation is lower in countries that allocate smaller resources as a percentage of GDP on cash transfers which target the poor (Peru and Mexico). Lindert (2004) confirms that resources allocated to those living under thepoverty line (PL) are small in countries in which poverty and inequality are high.

The long-run findings also demonstrate that a 1-unit rise in taxes on goods and services decreases poverty by 0.012 in the long run. The probable explanation is that as governments in developing countries are trying to maximise the revenue, the progressivity of taxes on goods and services with differentiated rates would be preferable for poverty alleviation. This may incorporate zero rates or exemptions for some basics necessities such as flour, rice, vegetables etc. Given that policymakers may lose revenue by including zero rates or exemptions, governments need to make a trade-off between the distribution of income and efficiency. However, the zero-rating of certain goods will ameliorate the welfare of those below the PL. Consumption of these basic necessities reduces as people move into higher income groups. This means that preferential tax treatment of basics necessities will benefit the poor. It could also mean that revenue mobilised from taxes on goods and services can be used to offer social good and services such as education to ameliorate the welfare of the poor. This is consistent with the results of Bird and Zolt (2005), Casale (2012) and Maina (2017), which confirm that the distributional impact of indirect taxes (tax on goods and services which include consumption taxes or VAT) are more relevant than PIT, given that indirect taxes affect individuals in the formal and informal sectors.

The results also revealed that personal income tax is statistically insignificant in reducing poverty in developing countries. This could be for several reasons: first, PIT is not much progressive and plays a small role in the tax structure in most developing countries. Revenues from PIT represent only 9% of total tax revenue and less than 2% of GDP in developing economies. This reduces its significant effect on poverty. Second, progressive PIT structures involve economic efficiency, and real administrative, political and compliance costs. The costs related to poorly administered and poorly designed PIT structures are probably higher compared to the costs related to other taxes. The third reason is that there is also an opportunity cost. This means that if developing countries want to use tax design for poverty alleviation, different perspectives such as government spending programmes in targeting the poor need to be considered. This is in line with the results of Bird and Zolt (2005). In our case, as expected, a 1 unit increases of government spending on education reduces poverty by 0.017. Government spending on education is largely regarded as a tool for reducing poverty, by augmenting productivity and the potential earnings of poor. This is in conformity with the findings of Bird and Zolt (2005).

Table 7: Results of FMOLS and DOLS

FMOLS Test			DOLS Test	
Variable	Coef.	Prob.	Coef.	Prob.
Tax_corp	-0.023222***	0.0000	-0.020610	0.0000
Tax_indiv	-0.004987	0.4078	-0.005652	0.2689
Tax_g_s	-0.012238***	0.0000	-0.009286	0.0000
Educexp	-0.017252***	0.0004	-0.015778	0.0001
GDPPC	-0.001513	0.1472	-0.001103	0.2211

***, ** and * demonstrate that the null is rejected at 1%, 5% and 10%, respectively. By using FMOLS, the coef. covariance was computed employing a default method while long run covariance estimates were determined by Bartlett Kernel and user bandwidth 6. Compared to FMOLS, DOLS were computed using Bartlett Kernel and Newey West Fixed Bandwidth as long run covariance estimates, while lags and leads methods were not determined (none of which indicate static OLS leads and lags specifications).

5.4 PMG Results

Although the Pedroni and Kao techniques allowed us to check the existence of cointegration, they could not offer an estimation of the long run association. For robustness checking, we use the PMG test to support the results from FMOLS, which showed the importance of tax on goods and services, and corporate tax, in reducing poverty in developing economies.

The results from Table 8 show that there is a strong significant and negative association between TGS and CIT and poverty in the long-term in developing countries. The magnitude of CIT and TGS, which is also significant, is approximately -0.029 and -0.028 respectively. However, the short-run association is statistically significant with the error correction term of 0.059. This means that the short-term disequilibrium from long-term equilibrium is corrected at the speed of 6% (speed of adjustment) each year. It is important to mention that the short-run significant impact of taxes (direct and indirect taxes) on poverty can be expected because as endogenous economies, developing countries usually confront different shocks, which temporarily and negatively affect the macroeconomic dynamics and undermine variables in the short-run.

Table 8: PMG Results

Dep. Var. Headcount		
Var.	Coef.	Prob.
	LR eq.	
Tax_corp	-0.029488***	0.0000
Tax_indiv	0.064659	0.0000
Tax_g_s	-0.028381***	0.0000
Educexp	-0.002230***	0.3138
GDPpc	0.004510	0.0000
	SR eq.	
CointeQO1	-0.059289	0.0042
D Tax_corp	-0.003063	0.2920
D Tax_indiv	0.004673	0.6990
D Tax_g_s	-0.001061	0.7046
D Educexp	0.000874	0.8627
D GDPpc	-0.000579	0.0821

***, ** and * demonstrates that the null is rejected at 1%, 5% and 10%, respectively. Dependent lags: 1 (fixed). Dynamic independent variables: (1 lag, fixed).

5.5 Dumitrescu-Hurlin Panel Causality Results

After applying DOLS and FMOLS, we performed Dumitrescu-Hurlin panel causality test to assess the direction of homogeneous causality among our variables in the short run.

Table 9. Dumitrescu and Hurlin panel causality technique.

Null hypothesis	Z-bar-statistic	P-value
Tax_corp does not cause headcount	13.8919***	0.0000
Headcount does not cause Tax_corp	5.3212	1.E-07
Tax_indiv does not cause headcount	20.6228***	0.0000
headcount does not cause Tax_indiv	3.7675***	0.0002
Tax_g_s does not cause headcount	13.0982***	0.0000
Headcount does not cause Tax_g_s	2.3324**	0.0197
Educexp does not cause headcount	7.2402	4.E-13
Headcount does not cause Educexp	19.0925***	0.0000
GDPpc does not cause headcount	5.2230	2.E-07
Headcount does not cause GDPpc	2.8728**	0.0041

***, ** and * demonstrate that the null is rejected at 1%, 5% and 10%, respectively. Lag: 1. Note that Dumitrescu and Hurlin test for homogeneous causality among variables.

Since the aim of this dissertation was to analyse the long term relation among direct and indirect taxes and poverty, the findings of this technique were concentrated TGS and CIT which, alleviate poverty in developing economies.

Table 9 demonstrates that the null hypothesis of Corporate Taxes does not cause poverty incidence and is rejected at the 5% significance level, showing that there is unidirectional causality running from Corporate Taxes to poverty incidence in the short-run. This implies that in the short-run, the variations in Corporate Taxes in developing economies significantly lead to changes in poverty incidence. In another, in a short run a decrease in CIT decreases prices of goods and services. This reduction in the prices increases the purchasing power of poor, which increases their disposable income and reduces their poverty. Furthermore, Table 9 also indicates that the null of Taxes on Goods and Services (TGS) does not cause poverty incidence and can be rejected at 5% significance level. This result shows that there are bi-directional causalities between TGS and poverty incidence, indicating that in the short term, variations in Taxes on Good and Services result in variations in poverty incidence, and vice versa. This means that an increase in TGS reduces the purchasing power of poor and increases the level of poverty. Therefore, the tendency of government to combat it may lead to fiscal policy decisions.

CHAPTER 6: CONCLUSIONS AND POLICY IMPLICATIONS

This study investigates the effect of direct and indirect taxes on poverty in a panel of 37 developing economies from 1996 to 2015 using a panel cointegration technique. The choice of panel cointegration is due to its capability to investigate the long run relationship between direct and indirect taxes and poverty in developing economies. Data was constructed from different sources such as UNU-WIBER, WBI and Povcalnet. However, the study had two objectives: first, it tested whether there is a long run relationship between direct and indirect taxes and poverty in the developing world. Second, it tested whether direct or indirect taxes are effective for poverty reduction in developing economies. To test for the presence of long-run associations between direct and indirect taxes and poverty, we first control for the panel unit root tests, as a precondition, using different techniques. The findings showed that all the series were stationary at first difference.

We then tested for the existence of cointegration employing the Pedroni (1999), Kao (1999) and Johansen (1999) cointegration techniques. The results revealed that except for the Pedroni Panel cointegration test results which showed no cointegration, findings from the other two techniques (Kao and Johansen-Fisher) confirmed that there was a presence of long run relations among variables in the developing world. The drawback of these techniques is that they are unable to estimate the long run association among variables.

In order to estimate the long term link between variables as well as to know whether direct or indirect taxes are effective in alleviating poverty in developing world, this dissertation used FMOLS and DOLS. The findings showed that in the long run an increase in corporate income tax (direct taxes) and taxes on goods and services (indirect taxes) reduces poverty in developing economies. The argument that an increase in personal income tax decreases poverty in developing world was rejected. These results support the findings reported by Bird and Zolt (2005) who found that PIT played a small role in alleviating poverty in developing economies. In addition, such taxes may not be more progressive in several developing economies as the costs of PIT implementation are very high, while the gains are very low. The findings also revealed that government expenditure on education is one of the effective tools in reducing poverty through productivity and potential earnings.

It is vital to note that poverty reduction depends not only on direct tax, but also on indirect tax and welfare. However, an integrated study including indirect tax, direct tax and welfare is required to offer a comprehensive picture of this analysis. Most recent policy recommendations on the study of the impact of taxation on poverty are specifically important here. Scholars (see for instance Mirrlees et al. (2011)) indicate in a UK review that policymakers fail to analyse taxation system in full and recognise that PIT is the most suitable tool for redistribution purposes. However, Tuan's (2003) major recommendation in a World Bank publication is that regressivity of the applicable fiscal policy incorporating indirect, direct taxes, and government spending on education, health etc. should be analysed in full.

The policy recommendations of this study's results are that policymakers can utilise transfers and taxes to redistribute income ex post, and they can use government expenditure; through the provision of public goods and services—to reshape the distribution of "opportunities" and foster mobility within and across generations (Kathleen and Christiaensen, 2019). We advise that firstly, resources generated from direct and indirect taxes should also be allocated to education, specifically at an early stage, in order to alleviate poverty in developing economies. Investing in human capital by providing lower income earners with training, skills and education, may decrease poverty. This is helpful for the poor, given that they gain the skills required to increase their productivity and raises their wages (Ravallion, 2001). Higher skilled employees may also help their economy to benefit from globalization through the absorption of new technologies. Secondly, despite its short-run characteristic in reducing poverty, and given budgetary constraints, we advise policymakers to continue implementing a redistribution policy. The argument is that it is effective in reducing poverty through cash transfers in a short-run, and that it contributes to poverty alleviation in the long-run if beneficiaries of that income invest it in human capital such as education, which is one of the effective human capital indicators for long-run poverty reduction. Thirdly, to avoid fiscal Impoverishment, policymakers should design the transfers and tax system in such a way that cash transfers should be higher to compensate for what the poor are paying in taxes.

As with all empirical analysis, research has certain limitations. However, the main limitation linked to our dissertationwas an empirical issue. This related to the econometric methodology applied to test the long run effect of indirect and direct taxes on poverty in the developing world. In fact, the first generation panel unit root techniques used in this dissertation did not control for cross-sectional

dependency in the data. Pesaran (2004) demonstrates that cross-sectional dependence needs to be identified, especially when the sample is assumed to contain the same groups of economies. Despite this limitation, our results still remain robust, because the first generation panel unit root techniques are based on cross-section independence assumption. Studies (see for instance, Worthington and Higgs, (2010) and Ahmad et al. (2013) show that findings from the first generation are empirically robust.

Therefore, this dissertation provides a new methodological study in the context of taxes and poverty empirical analysis in developing countries, and some policy recommendations that confirm recent studies. The findings of this dissertation provide the main role played by an integrated analysis, which combines indirect and direct taxes, in reducing poverty in the long-run in developing economies. However, further study should particularly focus on country-specific analysis, especially within an integrated analysis framework.

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